

ABSTRACT OF THE INVENTION

A system for actively damping the low-frequency coloration of sound in a listening room is provided comprising an acoustic wave sensor, an acoustic wave actuator, and an electronic feedback controller. The listening room defines at least one mode of low-frequency coloration. The acoustic wave actuator is substantially collocated with the acoustic wave sensor within the listening room. The electronic feedback controller is operative to generate a signal at its output by applying a feedback controller transfer function. The feedback controller transfer function comprises a second order differential equation including a first variable representing a predetermined damping ratio and a second variable representing a tuned natural frequency and creates a 90 degree phase lead substantially at the resonant frequencies of at least one mode of low-frequency coloration. The feedback controller output signal represents a rate of change of volume velocity to be produced by the acoustic wave actuator. Further provided are methods for actively damping the low-frequency coloration of sound within a listening room and systems for actively treating noise within a fluid-carrying duct, including those which employ active low- and high-pass acoustic filters.